As a leading research university, HKUST aims to pursue knowledge in both fundamental and applied areas, and collaborate closely with business and industry in promoting technological innovation and economic development. During the year, the University’s achievements in research and development once again confirmed HKUST’s position as a world-class tertiary institution and contributed to the region’s transformation into a knowledge-based society.

**Academic Research**

This year, HKUST’s academic research work continued to score remarkable achievements and earn both local and international recognition.

In the October 1999 issue of *Economic Inquiry*,
leading journal in the field of economics, HKUST was ranked the top university in East Asia in terms of research productivity in economics. In the Financial Times published on 24 January 2000, HKUST’s School of Business and Management was ranked 40 among the world’s top business schools in terms of research productivity; and its MBA program made the newspaper’s top-75 list. HKUST was the only Asian institution selected for the list.

All four Schools of the University made outstanding achievements in research. The following are some examples:

- Dr Wei-Ping LI of the Mathematics Department, in his joint work with Prof Zhenbo QIN of the University of Missouri, was successful in providing a mathematical proof of the blow-up formula of the S-duality conjecture formulated by Vafa and Witten. This is an important step towards understanding the geometric properties of the moduli spaces of vector bundles over algebraic surfaces.

- Drs Zikang TANG and Ning WANG of the Physics Department successfully fabricated uniform arrays of the world’s smallest single-walled carbon nanotubes (see picture on P.50). The results provided new leads in fundamental and applied research into the properties of electrons in one-dimensional systems.

- Prof Ming Lei LIOU and Dr Oscar AU, together with PhD candidate Alexis TOURAPIS of the Electrical and Electronic Engineering Department, developed a fast motion estimation technique for effective compression of video data. The technique was recognized by the Motion Picture Experts Group as

...
part of its MPEG-4 standard—a new global standard for multimedia applications.

Dr Chun Man CHAN of the Civil Engineering Department introduced an innovative computer-aided optimization system for the design of tall buildings. The system not only allows engineers to cut design time, but also enables them to maximize usable floor area and reduce construction costs.

Dr James C WESTLAND, Head of the Information and Systems Management Department, and Associate Professor Theodore CLARK of the same Department published an advanced postgraduate textbook entitled Global Electronic Commerce: Theory and Case Studies. It has since become one of the internationally best-selling textbooks on e-commerce.

Led by Dr Erik BAARK of the Social Science Division, a team of scholars from the Division, Economics Department, and Technology Transfer Center developed a set of science and technology indicators for the Industry Department of the HKSAR Government. The indicators will provide researchers and policy-makers with more appropriate information to assess the level of Hong Kong’s development in science and technology.

■ 電機及電子工程學系劉名雷教授、區子康博士及博士生Alexis Tourapis共同開發快速搜尋活動影像估計技術，獲活動影像專家組織選錄在第四系列標準(MPEG-4)之內，成為國際多媒體技術標準的一部分。

■ 土木工程學系陳俊文博士成功開發一套供高層樓宇設計應用的計算機輔助優化系統，不僅可以縮短高層樓宇的設計時間，還可以幫助工程師充分利用樓面面積和降低建造成本。

■ 資訊與系統管理學系主任韋仕林博士和該系郭泰德博士合著的《全球電子貿易：理論與個案研究》已成為暢銷世界各地的電子貿易教科書。

■ 由社會科學部、經濟學系、技術轉移中心等學者組成的小組，為香港政府工業署設計合適的科技發展統計指標，讓研究人員和制定政策者可以有適當的參考數據，評估香港的科技發展水平。

■ 人文社會科學學院兩個學部的學者在該院院長丁邦新教授領導下，與中國社會科學院合作開發漢語語音系統數據庫，有助研究人員了解漢語和藏語的語源分類。
Applied Research and Technology Transfer

One of HKUST’s primary missions is to work on research projects that are closely related to the development of society. As a result, many research projects at HKUST, though fundamental in nature (examples include the video data compression technology and tall building design optimization system mentioned above), have often been regarded by industry as having high market potential. With contribution to society in mind, researchers readily convert their research achievements into applied projects, a further step towards the development of marketable products or services.

During the year 1999-2000, six US patents were granted to the inventions of HKUST researchers, bringing the number of registered patents owned by the University to 23. In addition, the University filed another 15 patent applications during the year. As of the end of June 2000, HKUST had 53 patent applications pending.

Over the past year, HKUST signed eight licenses transferring the University’s innovative technologies to local industry.

Besides patent licensing, HKUST researchers also served the community (business, government, and non-
profit organizations) in various other capacities. For example:

Prof Philip CHAN, Head of the Electrical and Electronic Engineering Department, helped the Hua Ko Electronics Co Ltd develop flip-chip integrated circuit packaging technology. On 15 October 2000, the Company won the "Outstanding Innovations and Technological Products Silver Award" from the Hong Kong Electronics Industry Association for the technology developed.

HKUST's Molecular Neuroscience Center and the Hospital Authority of the HKSAR Government joined hands to establish the Neuroscience Alliance of Hong Kong, which provides scientists and clinicians with opportunities in further education, training, research, and clinical practice.

Prof Tongxi YU of the Mechanical Engineering Department undertook the Occupational Safety and Health Council's safety helmet testing project, thereby making an important contribution to local occupational safety.

Research and Development

In 1999-2000, HKUST research staff achieved a project budget of HK$2.802 billion, an increase of 25% compared to the previous year. This increase is largely attributed to the growth of research projects funded by both the government and the private sector.
Research and Development Funding

In 1999-2000, HKUST secured HK$280.2 million for new research projects, a 25% increase over the previous year. Most of this growth came from funding for industry-related research.

About 40% of on-going research projects was funded by the Research Grants Council (RGC); the rest being supported by the Innovation and Technology Fund (31%), the private sector (17%), and the University Grants Committee (11%).

In this year’s Competitive Earmarked Research Grants program of RGC, HKUST continued, for the seventh consecutive year, to achieve the highest success rate (58%) among all local tertiary institutions. A total of 150 new projects were funded with a total amount of HK$76.643 million.

In addition to the Earmarked Grants, researchers at HKUST were successful in winning research funding from a variety of sources, demonstrating that the University has reached the level of an international as well as a national institution.

RGC’s Cooperative Research Center (CRC) Program granted HK$9.646 million to support four university-industry collaborative research projects in the areas of advanced engineering materials, the Internet, liquid crystal display, and molecular biology. The CRC Program requires that each proposal must win a minimum of 20% supplementary funding commitment from industry.

Dr Qiang DU of the Mathematics Department was appointed Chief Scientist for the National “973” project on Large-scale Scientific Computation.
Research by the Ministry of Science and Technology. The initial two-year budget for the project was RMB 13 million.

The NSFC/RGC Joint Research Scheme funded by the National Natural Science Foundation of China (NSFC) and the RGC offered HK$2.96 million and RMB1.44 million, respectively, to support work by researchers at HKUST and their partners in the Chinese Mainland in four advanced areas: nanostructure materials, microelectronics, optoelectronics, and marine and environmental science.

Dr Mingjie ZHANG of HKUST’s Biochemistry Department, Prof David BREDT of the University of California, San Francisco, and Prof Shin’ichi TAKEDA of the National Institute of Neuroscience in Tokyo were awarded a grant of US$600,000 by the prestigious Human Frontier Science Program to undertake an international research project on the biological functions of nitric oxide.

HKUST researchers achieved very satisfactory results in competing for funding offered by the Joint Research Schemes sponsored by the RGC and local representatives of three European countries. Out of the 20 proposals funded by the France/Hong Kong Joint Research Scheme, ten came from HKUST. In the Britain/Hong Kong Joint Research Scheme, four out of five HKUST proposals received funding. In the Germany/Hong Kong Joint Research Scheme, six HKUST projects received support and three projects funded last year had their funding renewed.

**HKUST Entrepreneurship Program**

The HKUST Entrepreneurship Program was initiated...
in July 1999, and the University’s Entrepreneurship Center was officially opened in February 2000. During the year, the Program assisted a number of HKUST faculty and staff members, alumni, and postgraduates to establish a total of 18 start-up companies. The businesses of these start-ups cover a wide range of technological areas: biotechnology, consumer electronics, crash barriers, pharmaceuticals development, indoor air quality, Internet services, and microelectronics.

By taking the initiative to help HKUST members set up their own technology companies, the University not only enables the commercialization of research projects with market potential, but more importantly, assists Hong Kong in creating an atmosphere conducive to the development of high technology. The Program also provides more job opportunities for graduates with a technology background.

The University’s Research and Development branch has been actively exploring additional financial resources to further develop the Entrepreneurship Program and the Entrepreneurship Center, including seeking support from major venture capital firms.

In addition, the “Shenzhen-Hong Kong Industrial, Educational, and Research Institution”** set up jointly by Peking University, HKUST, and the Shenzhen Municipal Government; and the “Nansha IT Park” established by the Fok Ying Tung Foundation and the University will also provide support to HKUST’s entrepreneurial members in terms of facilities, space, and personnel recruitment and training.

* The Institution has been renamed the PKU-HKUST Shenzhen-Hong Kong Institution.